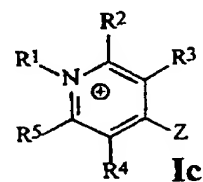
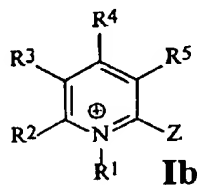
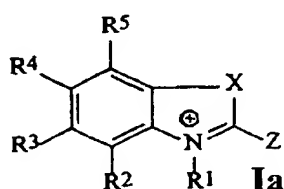
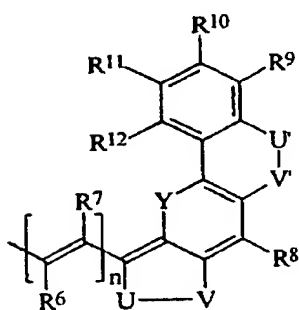


# Patent Claims

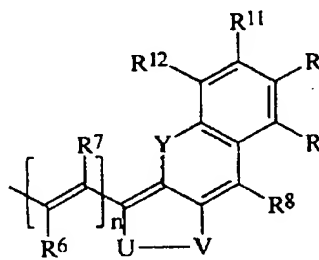
1. Laser-compatible NIR marker dyes based on polymethine, containing substituted derivatives of benzoxazole, benzothiazole, 2,3,3-trimethylindolenine, 2,3,3-trimethyl-4,5-benzo-3*H*-indolenine, 2- and 4-picoline, lepidine, chinaldine and 9-methylacridine of the general formula Ia or Ib or Ic



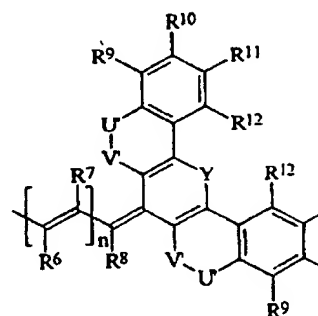
where Z is



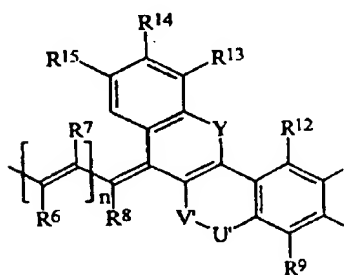
or



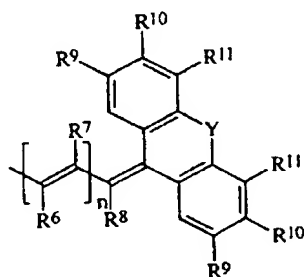
or



or



or



wherein

- X or Y is an element from the group comprising O, S, Se or the structural element N-alkyl or C(alkyl)<sub>2</sub>,
- n represents the numerical value 1, 2 or 3,
- R<sup>1</sup> - R<sup>15</sup> are identical or different and can be hydrogen, one or more alkyl- or aryl-, heteroaryl- or heterocycloaliphatic groups, a hydroxy or alkoxy group, an alkyl-substituted or cyclic amine function and/or two *ortho* groups, e.g., R<sup>2</sup> and R<sup>3</sup>, together can form another aromatic ring,
  - at least one of the substituents R<sup>1</sup> - R<sup>15</sup> can be an ionizable or ionized substituent such as SO<sub>3</sub><sup>-</sup>, PO<sub>3</sub><sup>-</sup>, COO<sup>-</sup> or NR<sub>3</sub><sup>+</sup> which determines the hydrophilic characteristics of these dyes,
  - at least one of the substituents R<sup>1</sup> - R<sup>15</sup> can represent a reactive group which enables a covalent linking of the dye with the carrier molecules mentioned above, and
  - U-V or U'-V' are identical or different and can comprise hydrogen, a saturated aliphatic, heteroaliphatic or a lactone or thiolactone grouping.

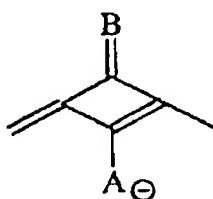
2. Laser-compatible NIR marker dyes according to claim 1, characterized in that the reactive group is selected from the following functionalities: isothiocyanates, monochlorotriazines, dichlorotriazines, aziridines, sulfonyl halides, *N*-hydroxysuccinimide ester, imido esters, glyoxal or aldehyde for amine and hydroxy functions or maleimides or iodacetamide for thiol functions and phosphoramidites for labeling DNA or RNA or fractions thereof.

3. Laser-compatible NIR marker dyes according to claim 1, characterized in that the reactive group is bonded to the actual chromophore via spacer groups of the general structure -(CH<sub>2</sub>)<sub>m</sub>-, wherein m can have values from 1 to 18.

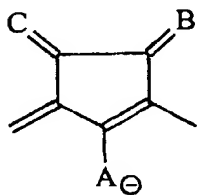
4. Laser-compatible NIR marker dyes according to claim 1, characterized in that the structural unit =CR<sup>7</sup>- also contains a bridge over four-, five-

and six-member ring systems, wherein reactive groups are also located at the latter and substituents A-G can have the same functionality as substituents R<sup>1</sup>-R<sup>15</sup>.

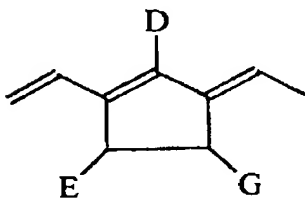
5. Laser-compatible NIR marker dyes according to claim 4, characterized in that the structural unit =CR<sup>7</sup>- (n = 2) represents



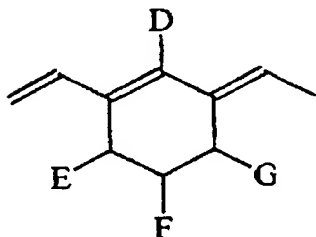
6. Laser-compatible NIR marker dyes according to claim 4, characterized in that the structural unit =CR<sup>7</sup>- (n = 2) represents



7. Laser-compatible NIR marker dyes according to claim 4, characterized in that the structural unit =CR<sup>7</sup>- (n = 3) represents



8. Laser-compatible NIR marker dyes according to claim 4, characterized in that the structural unit  $=CR^7-$  ( $n = 3$ ) represents



9. Laser-compatible NIR marker dyes according to claim 4, characterized in that substituents A-C represent O, S, C(CN)<sub>2</sub> or N-R, wherein R in N-R can represent an aliphatic or aromatic or reactive aliphatic or aromatic group such as (CH<sub>2</sub>)<sub>n</sub>COOH or (CH<sub>2</sub>)<sub>n</sub>NH<sub>2</sub>.

10. Laser-compatible NIR marker dyes according to claim 4, characterized in that substituent D represents Cl or an aromatic or aliphatic ring system on which reactive substituents corresponding to R<sup>1</sup> to R<sup>15</sup> are possibly arranged.

11. Laser-compatible NIR marker dyes according to claims 1 to 10, characterized in that they are used for optical labeling of proteins, nucleic acids, oligomers, DNA, RNA, biological cells, lipids, polymers, drugs or polymer particles.

12. Method for qualitative or quantitative determination of proteins, nucleic acids, oligomers, DNA, RNA, biological cells, lipids, polymers, drugs or polymer particles, characterized in that the functional groups of the laser-compatible NIR marker dyes are covalently linked to an OH-, NH<sub>2</sub>- or SH-function of the substances to be determined.

13. Method according to claim 12, characterized in that the coupling reaction is carried out in aqueous solution.